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NAME OF AUTHOR/*NOM DE L'AUTEUR* Ruby L. Cottreau

TITLE OF THESIS/*TITRE DE LA THÈSE* Training in Refective Problem Solving Strategy

UNIVERSITY/*UNIVERSITÉ* University of Alberta

DEGREE FOR WHICH THESIS WAS PRESENTED/*GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE* M. Ed.

YEAR THIS DEGREE CONFERRED/*ANNÉE D'OBTENTION DE CE GRADE* 1977

NAME OF SUPERVISOR/*NOM DU DIRECTEUR DE THÈSE* Dr. L. L. Stewin

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TRAINING IN REFLECTIVE PROBLEM SOLVING STRATEGY

by

© Ruby L. Cottreau

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

AND RESEARCH IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF MASTER

IN EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

FALL, 1977

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Training in reflective problem solving strategy" submitted by Ruby L. Cottreau in partial fulfillment of the requirements for the degree of Master of Education.

L. Steven
Supervisor

Ruth Short

Date August 2, 1977

ABSTRACT

Experimental evidence implicating cognitve impulsivity in a variety of learning problems had led to interest in attempts to modify the less-than-adequate impulsive strategies. Research efforts currently underway are concerned not simply with modification but with the generality and stability of such training effects.

This present investigation used an intervention technique developed by Meichenbaum and Goodman(1971) and subsequently applied to retarded individuals by Guralnick(1976). The self-instructional model had consistently significant results reported in modification of impulsive strategies, and combined with suitable materials, it was hypothesized that training in self instruction would result in a generalized training effect to the Matching Familiar Figures Test.

Initially 80 retarded children aged 8-18 were tested on a match-to-sample visual discrimination task and based on a median split procedure of score and latency, 23 subjects were classified as "impulsive"

individuals. This group was randomly assigned to a training group and two control groups. The training group received self-instructional training while practicing a reflective strategy which is first modelled by a trainer. The self-instructional sequence then required that the trainer fade out external cues and prompts, and the subject guided his own problem-solving strategy with overt to covert verbalizations. The two control groups were sepcial-attention control and no-training control.

The analysis of covariance conducted on the data did not substantiate the hypothesis predicting treatment effects and empirical support for a generalized training effect was not realized.

ACKNOWLEDGEMENTS

The author would like to express appreciation to Dr. L. Stewin, thesis supervisor, Dr. P. Miller and Dr. R. Short, thesis committee members and to Dr. D. Baine, who provided constructive comments on the training materials.

My special gratitude is extended to Dr. Dong Yul Lee, Psychological Services, The Michener Center, who fulfills our chief want in a teacher--"to make us do that which we can." Dr. Lee "guided, inspired and instructed" in all phases of the study and I gratefully acknowledge his kind, generous and invaluable assistance.

This study could not have been completed without the assistance of many individuals at The Michener Center. Those who assisted with the training program were: Linda Barnes, Sherry Brown, Bonny Lynn Damberger, Wayne Doan, Susan Mah, Barbara Proudler, Rowe Anne Rivet, Paul Snair, and Debbie Thivierge. The writer is also indebted to Sue Teucher for the visual discrimination line drawings and to Kurt Hafso for the drawings in the Question-answering program. My appreciation also to the Principal and teachers at The Michener Center School for their kind cooperation.

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CHAPTER I

INTRODUCTION

Background to the Study

Prior to the '60's, individual differences in the cognitive processes of perception, memory and problem-solving were viewed as reflecting differences in basic intelligence. More recently, the contribution of other factors such as motivation, anxiety and attitudes as they contribute to individual differences in performance have been studied. The study of cognitive style falls into this category, and is a major research approach to understanding performance differences which occur within developmental levels.

In the early 1960's, Kagan and his associates became aware of the differences in methods which children used in exploring and processing various stimulus configurations (Kagan, 1966a; Kagan, Moss and Sigel, 1963; Kagan, Rossman, Day and Albert, 1964). The consistencies in the mode of intake, processing and organization of material across a variety of stimulus situations is called cognitive style (Rossman, 1962). According to Kagan (1965b), cognitive style is manifest in a child's consistent tendencies to

respond slowly or rapidly when confronted with a problem solving situation that has uncertainty. Uncertainty is assumed to exist in situations where several alternative choices are available and the correct alternative is not immediately apparent (Kagan et al.,1964). A fundamental dimension underlying cognitive style is the impulsive-reflective dimension. The reflective child is characterized by his long delays before responding to a problem and by the usual correctness of his responses. The impulsive child has short response times which often result in incorrect choices (Kagan, 1965a, 1966). Presumably the reflective child, during the lengthier period before his first response considers and evaluates possible response alternatives while the impulsive responder offers answers quickly and without sufficient consideration of the probable accuracy of his answer.

A significant number of studies have indicated that impulsive children perform more poorly on a wide variety of problem situations than do reflective children (Kagan and Kogan, 1970). The reflective child is less likely than his impulsive peer to commit errors on serial learning(Kagan, 1966), on word recognition (Kagan, 1965b), on arithmetic problems(Cat cart and Liedke, 1969), and on inductive reasoning tasks (Kagan, Pearson and Welch,1966). The reflective child is less distractible (Kagan et al.,

1964) and less likely to make errors in reproducing Bender designs (Kagan, 1965a).

In view of this and despite evidence suggesting that reflective and impulsive attitudes are relatively stable response dispositions (Kagan and Kogan, 1970), a growing body of research (Egeland, 1974; Zelniker and Oppenheimer, 1973; Meichenbaum and Goodman, 1971; Lowry and Ross, 1975; Duckworth, Ragland, Sommerfeld and Wyne, 1974), has been focussed upon developing ways of modifying conceptual tempo. The important and relevant educational implications for children with developmental handicaps who have not developed reflective problem-solving strategis has both practical and theoretical significance. If the impulsive disposition is a handicap in a typical school situation as indicated by the research, then it is an additional detriment to a handicapped child who is often assumed not to have the ability to perform many tasks. Because there appears to be considerable correspondence between the problem-solving styles of mildly retarded and impulsive children(Errickson, Wyne and Routh, 1973), the techniques for altering the style of impulsive children may be useful for retarded children as well, and thus becomes an important source of information about methods with the mentally handicapped.

Recent studies of modification of so called "impulsive" children have demonstrated that children can be taught more effective search and scanning strategies. That is, when impulsive children are trained to respond less quickly and learn to systematically scan all the alternatives, they make less errors (Guralnick, 1976; Meichenbaum and Goodman, 1971; Egeland, 1974). Many of the techniques which have been used in altering impulsive problem-solving techniques have been applied in modifying this style in children with various handicaps (Duckworth, Ragland, Sommerfeld and Wyne, 1974; Lowry and Ross, 1975; Wyne, Coop and Brookhouse, 1970; Guralnick, 1976).

Successful techniques which have produced a more reflective strategy as indicated by a decrease in errors have taken several forms. Errickson, Wyne and Routh (1973) worked with mildly retarded children simply by applying a "response cost" procedure. Tokens which were associated with the purchase of rewards were removed contingent upon incorrect responding. In contrast, most other successful techniques have focussed on instruction emphasizing certain aspects of the problem-solving process which subsequently produced a more reflective strategy. Some researchers have emphasized more efficient techniques of attention deployment (Zelniker, Jeffry, Ault and Parsons, 1972), while others have included instruction in

visual discrimination (Duckworth, Ragland, Sommerfeld and Wyne, 1974). Exposure to filmed modelling (Ridberg, Parke and Hetherington, 1971) as well as modelling (Debus, 1970; Denney, 1972; Yando and Kagan, 1968) have been used. In general modelling as well as specific training to inhibit rapid responses (Kagan, Pearson and Welch, 1966b) has produced increased response latencies in the impulsive children but with no corresponding decrease in errors.

The most consistent results in terms of response time and errors have been obtained by exposure to certain training materials while teaching a strategy employed by reflectives, using the self-instructional method. Meichenbaum and Goodman (1971) developed this paradigm utilizing the idea that impulsive individuals benefit from self-speech. Guralnick (1976) then applied this same technique in teaching retarded individuals a more reflective strategy. Although he demonstrated that self-instruction facilitated performance on the posttest, it did not generalize to the Matching Familiar Figures Test.

Definition of the Problem

A review of the literature revealed that although the relative efficacy of various techniques was demonstrated with various populations, there was a need to explore the generality and persistence of these training effects. The consistently significant results of the self-instructional method and the practical need to have children use the newly learned reflective strategy in different problem situations initiated this study. This study represents an attempt to obtain a generalized training strategy using the self-instructional method. The sample was a group of retarded children, and generalized training strategy was measured by performance on a match-to-sample task. Previous attempts in training have concentrated on measuring training effects with materials which were highly similar. The posttest(MFFT) used in this study was composed of standards and alternatives which were different from those used in training and were thus defined as representing a transfer effect.

CHAPTER II

REVIEW OF THE LITERATURE

Part I: THE CONCEPT OF RESPONSE STYLE

Definition:

The reflective-impulsive dimension of conceptual tempo describes the tendency to reflect on the validity of problem-solving under a very special condition, namely when several possible alternatives are available and there is uncertainty over which is the most appropriate. Tasks used to measure reflection-impulsivity present the subject with several highly plausible alternatives only one of which is correct. Thus experimental subjects who respond quickly often make mistakes whereas those who pause to reflect on response alternatives are more often correct. The most common operational definition of reflection-impulsivity includes response time and errors.

While the dual index may be a measure of the tendency to delay before responding, it seems appropriate to inquire into its ability to measure whether a subject is evaluating or considering the alternatives. Several studies elaborate on this. Kagan, Pearson and Welch (1969a) reported that response time was directly related to the number of glances

at the standard and the alternatives. The implication from this is that reflective subjects are more active in studying variants. Siegelman(1969) used an apparatus in her study which required that the subjects press a button to bring a figure into focus. In this way, the experimenter knew exactly what the subject wanted to see. The findings showed that reflectives looked longer and more often than the impulsives. Drake(1970) used the Mackworth eye camera to record eye fixation and found that reflectives a) looked at a larger portion of the stimulus figures, b) had a larger number of looks at each figure and c) made about twice as many comparisons between or among homologous parts of different figures.

Measurement of the Reflective-Impulsive Dimension:

The instrument most commonly used in the measurement of the reflective impulsive-dimension is the Matching Familiar Figures Test (MFFT, Kagan et al., 1964). The three forms available are the Preschool, Elementary and Adult. The test format includes simultaneous presentation of a standard with a figure (e.g. a boat, a tree, a telephone) with four, six, or eight facsimilies differing in one or more details. On each of the test items, the subject is asked to select from the alternatives, the one that exactly matches the standard. The response time to the first response is noted and the number correct recorded.

In the early stages of his work, Kagan used the two measures of response time and accuracy as separate indexes, but more recently, a dual index has been used to differentiate between those subjects whose fast responses are associated with many errors (impulsive) and those fast-accurate subjects whose short response times are associated with few errors (Messer, 1976). The other two groups which are differentiated by the median split procedure of the dual index are the group with high response time associated with high error(slow-inaccurate), and the group with high response time associated with low error (reflectives).

Kagan (1966a) believed that latency had a bearing on accuracy, hence the consistent negative correlation between fast children making errors and slower children making fewer errors. The two groups that did not fit into either the reflective or impulsive category were believed to be either "bright subjects who can have relatively fast response times on easy tasks, but make few errors (Kagan, 1966, p. 503)", or slow-inaccurate subjects who had such a high level of anxiety that their performance suffered.

While a number of investigators (Drake, 1970; Nelson, 1969; Zelniker, Jeffrey, Ault and Parsons, 1972; Siegelman, 1969; McKinney, 1973; Weimer and Berzonsky, 1975), in addition to Kagan, have analyzed reflective and impulsive

differences, only two studies have examined the comparative problem-solving or scanning strategies of all four groups (Ault, Crawford and Jeffrey, 1972; Rollins and Genser, 1977). The exclusion of two groups from the mainstream of research has unfortunately left several controversial areas undiscussed.

a) What are the differences in problem-solving strategy between reflectives and fast-accurates. It has been assumed that it is easier or better to teach impulsive children to respond more reflectively than to teach them to be both fast and accurate for example.
b) What is the practicality of the reflective problem-solving strategy, and is it the most flexible strategy in a number of situations. For example, if the task had only two alternatives, or if there were very many solutions, would a reflective strategy be superior to the impulsive strategy (Rollins and Genser, 1977).
c) What is the role of latency on performance on the MFFt, and is the joint criteria in the definition of impulsivity and relectivity necessary.
d) What is the value of the median split procedure and its subsequent categorization of a sample into four groups.

Although these are important areas of consideration, it is not the purpose of the present study to show that these general assumptions are unwarranted. Rather on the

basis of the literature available, there is considerable evidence that "reflective" children are more systematic and more likely to obtain a higher success rate on a variety of tasks than their impulsive counterparts (McKinney, 1973; Ault, 1973; Nelson, 1969; Neussle, 1973; Ault, Crawford and Jeffrey, 1972; Kagan, 1965; Kagan, Welch and Pearson, 1966). Therefore the rationale of this study was to generate a stategy whose approach would result in the likelihood of a more successful method for those who displayed a haphazard manner.

Part II: SCANNING STRATEGIES OF REFLECTIVES AND IMPULSIVES

Impulsive and Reflectve Attention Deployment:

If one of the goals of conceptual tempo research is to plan more effective task strategies with the purpose of decreasing error scores, then it is important to examine some of the variables which comprise the R-I dimension. Since the research available focusses on impulsive and reflective differences, one useful way of approaching this question is to infer information processing strategies from visual scanning patterns of both reflective and impulsive subjects.

One of the first studies analyzing strategy differences of individuals was the study of head movements by Kagan (1965a). He found that

a) all children exhibited an almost constant glance of 3 seconds at the standard and that
b) there was a high correlation between response time and the number of eye/head fixations to the standard.

Subsequent attempts to study strategy differences have been more molecular. Siegelman(1969) compared differences in observing behavior of reflective and impulsive subjects. Reflective subjects had higher scores in absolute measures of frequency and duration of looking behavior. When the relative deployment of attention

was calculated however, the reflectives were found to devote proportionately less time and less frequent looks to the standard, to the most observed alternative and to the alternative finally chosen. The impulsive Ss ignored 2½ times as many alternatives as reflectives. In short, the impulsives displayed a more biased and peaked distribution of attention.

Drake(1970) recorded two bodies of data. The first was a record of the initial 6 seconds of exposure to the stimulus item, and the second a record of the total performance to the first choice. Drake found that during the first 6 seconds, the reflectives spent a larger proportion of their time regarding the standard, and they effectively scanned the whole visual array. She suggested that the impulsive children do not feel a great need to scan all the variants before choosing one.

Although there seems to be some contradiction between the Drake(1970) and Siegelman(1969) studies as to the actual amount of attention deployment, it can be explained as Weimer and Berzonsky(1975) have offered. They note that although the attentional deployment is adequate in terms of amount of time for the impulsive responder, it is inefficient because the deployment focusses on less relevant aspects of the task. The

researchers used Hagen's (1972) incidental learning task model to demonstrate how sixth grade reflectives focussed more upon central aspects, while impulsives learned more of the peripheral aspects of the task. Results were interpreted in terms of Hagen's two stage model of selective attention. The first stage was one of discrimination, where the subject identified both the relevant and incidental cues. The second stage involved focuses on the relevant features and ignoring of the incidental features. The researchers hypothesized that impulsive children have trouble in stage one, and trying to remember all the cues, would have difficulty in efficient and accurate problem-solving.

This is also suggested by Odom, McIntyre and Neale (1971), who found that the performance of reflectives is clearly influenced by the type of information being processed. That is, performance differences might be due to impulsive children deploying adequate processes on less relevant or more irrelevant information of a task.

Part III: MODIFICATION OF IMPULSIVE STRATEGY

Based on the findings of studies such as Siegelman (1969) and Drake(1970), attempts to modify the strategies of impulsive subjects have been developed. Egeland(1974) trained impulsive second graders by two methods-- a delay method and a search strategy. The training received by the search strategy group produced an effect on the error and latency scores. The strategy employed during training was designed to break each stimulus into parts and identify distinctive features. Subjects had to identify parts on the wrong alternatives on the match-to-sample tasks and had to complete other problem tasks as well. The initial training sequences were easy to discriminate match-to-sample tasks and allowed the child to practice the reflective strategy, so that it became nearly automatic. The emphasis in the Egeland(1974) study was on the development of training materials and exercises which would induce the child to attend to relevant features of the stimulus complex.

A paradigm emphasizing instructional method emerged from a series of studies with impulsive children (Meichenbaum, 1971; Meichenbaum & Goodman, 1969). In their studies they found that reflective children use speech in an instrumental fashion, i.e., that speech regulated and

guided their behavior. It thus appeared that impulsive children might benefit from learning to talk to themselves in a similar fashion. It was reasoned that some individuals are capable of language but do not generate or utilize language in performing non-language tasks. Further it appeared possible that external social stimuli could control speech so exclusively that some individuals respond only to external demand. This concept of generating or encouraging toward self-speech became the foundation of the self-instructional method and the self-instructional sequence which is summarized as follows.

a) An adult trainer models problem-solving using overt verbalizations.
b) The child verbalizes overtly while problem-solving.
c) The child verbalizes covertly while problem-solving.

By using this "fading" procedure, it was hoped that children could learn to provide themselves with verbal commands with functional significance and hence gain more effective problem-solving strategies. The five children in Meichenbaum's (1971) training group were selected from an opportunity remedial class and received four ½ hour training sessions over a two week period. A variety of tasks from simple sensorimotor tasks to more complex problems were employed to train the child to control his perform-

ance through the self-instructional method. The difficulty level of the tasks was increased over the training sessions, i.e., reproducing designs, following sequential instructions (taken from the Stanford-Binet), completing pictorial series (taken from the PMA), and solving conceptual tasks (taken from the Ravens Matrices Test). Participants in the self-instruction group showed significant performance improvement on the WISC, the Porteus Maze Test and on Kagan's Matching Familiar Figures Test.

The second part of the Meichenbaum and Goodman(1971) study examined the efficacy of the components of the self-instructional procedure. The subjects in this study were 15 impulsive kindergarten and first grade children who were randomly assigned to one of the three groups: Modelling, Modelling + Self-Instruction and Control The results indicated that rehearsal in self-instruction by the trainee was a necessary and indispensable part of the training procedures. In short, the modelling plus self-instruction altered the decision time and reduced errors. The modelling alone resulted in a slower response time, but no concomitant reduction in errors. A graphic representation of the results of this study is depicted in Table 1.

TABLE I

MODELLING and MODELLING + SELF INSTRUCTION

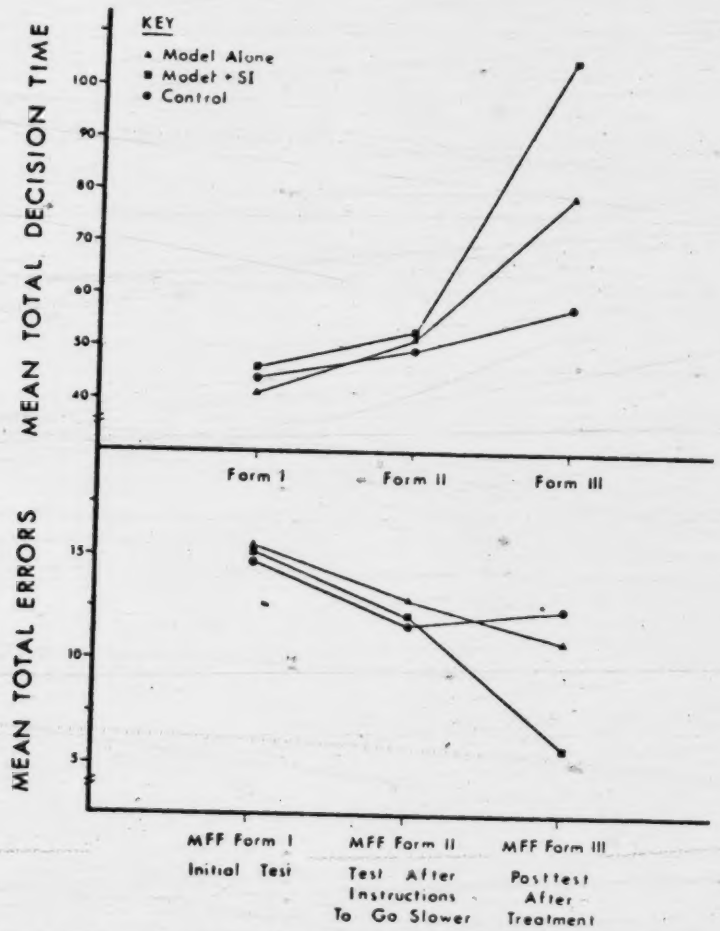

FIG. 2. MFF performances of impulsive Ss who were in a modeling-alone group, a modeling plus self-instructional training group, and an additional control group.

Meichenbaum and Goodman(1971, p.125)

In relation to this present investigation, the next step was to try and relate the self-instructional paradigm to a retarded population. The Guralnick(1976) study did this by comparing the effectiveness of three programs-- feedback method, modelling method and self-instructional method, all with retarded children. The three methods are summarized below.

a) Self-Instructional Method: The subjects in this group observed the trainer engage in verbalization of the instruction, with instructions regarding familiarization of the standard, and differentiation of the critical dimensions of the variants. The incorrect alternatives were eliminated,and when the correct alternative was chosen, self-reinforcement occurred in the form of verbal praise. The same verbalizations of the trainer were repeated overtly by the child and gradually faded out to a covert verbalization.

b) Modelling Method: The modelling group observed exactly the same verbalizations as the trainer verbalized in the Self-Instruction group, but did not go through the self-instructional sequence or the "rehearsal" of the instructions himself.

c)Feedback Method: The same materials were used as in the above groups, and the children were simply asked

to solve the match-to-sample task problems and given feedback as to the correctness of their response.

The self-instructional method used by Guralnick(1976) was essentially the same as that used by Meichenbaum and Goodman(1971). The task used in the training, the pretest and the posttest was a specially designed 6 alternative match-to-sample task composed of nonsense figures. And consistent with Meichenbaum and Goodman(1971), the group who received rehearsal in self-instruction attained superior performance on the posttest.

The components of the self-instructional technique as described by Guralnick(1976, 1973), was perceived by him to have a close correspondence to observational learning as developed by Bandura(1969). More specifically, Bandura's first stage was an attentional one, in which the child had to select relevant cues.

> "Since repeated contiguous stimulation alone does not always result in response acquisition, it is evident that additional conditions are required for the occurence of observational learning. Simply exposing persons to distinctive sequences of modeled stimuli does not guarantee that they will attend closely to the cues to which their attention has been directed. An observer will fail to acquire the matching behavior at the sensory registration level, if he does not attend to, recognize or differentiate the distinctive features of the model's responses. To produce learning therefore, stimulus contiguity must be accompanied by discriminative observation." Bandura, 1969(p.136)

That stage was facilitated in the Guralnick (1976) study by the model pointing out the distinctive features of the stimuli.

In Bandura's second stage, the retention phase, the child was required to utilize a representational system, usually verbal to code and recode events. Among the many variables which have influenced the retention process, the factors of "rehearsal operations" and "symbolic" coding operations have been most efficacious in facilitation of retention (Bandura, 1969). Observational learning can be enhanced through practice or overt rehearsal of modelled sequences (Margolius and Sheffield, 1961; Meichenbaum and Goodman, 1971). Many studies (Bower, 1969; Mandler, 1968; Paivio, 1969, Tulving, 1968), have indicated that observers of models are inclined to code, classify and reorganize elements into familiar and more easily remembered schemes. This coding may take various forms-- imagery, abbreviated verbal systems or larger integrated systems (Bandura, 1969). In Guralnick's study, the second stage was directly taught as verbal instructions were given by the model and subsequently rehearsed by the subject. In other words, the variables of "rehearsal and "symbolic verbal coding" were combined to form the technique called "self-instruction".

Bandura's third stage, the motor-reproduction stage was represented in Guralnick's study by the child's self-generated verbal instruction in which the verbalization guided the child's behavior. The procedure of directly instructing the child to verbalize the problem-solving procedure overtly and then covertly assisted in developing their own verbal control over behavior. Bandura's last stage of motivational processes was activated in the Guralnick study by external social reinforcement and subsequent self-reinforcement.

In summary, Guralnick's(1976) self-instructional model used in the match-to-sample tasks was believed to correspond closely to Bandura's observational learning model. The problem solving strategy taught by the self-instructional method facilitated performance on a form generalization test, but did not in any instance reach significant levels in the posttest performance of the MFFT. The study however, demonstrated the possibility of teaching retarded children an effective problem-solving strategy.

The aim of the present research was to develop a self-instructional program for retarded children similar to that of Guralnick's (1976) study but which would attempt to obtain a generalized training effect. The main

difference from the Guralnick (1976) study was in the materials used for training. The materials which were developed, were believed to be potentially relevant, based on the data from Guralnick(1976), Egeland (1974) amd Odom, McIntyre and Neale (1971). The absence of generalized training effect in the Guralnick (1976) study led him to suggest that "direct instruction in a number of qualitatively different problems is needed before a completely generalized strategy develops." (Guralnick, 1976, p.23). Accordingly, research with a materials emphasis was reviewed to provide the empirical bases for materials development.

Briefly, the Egeland (1974) study showed that a group of impulsive second grade children who were trained on search strategies on visual discrimination tasks showed significant improvement on MFFT accuracy and response time. The materials used included 1) two classes of stimulus configurations--geometric designs and nonsense words and 2) four different problem-solving tasks-- match-to-sample, match-to-sample recall tasks, memory for designs, and describing geometric designs.

Odom, McIntyre and Neale(1971) assessed performance of reflective and impulsive subjects in a visual match-to-sample task and compared their performance in three

transfer conditions-- prototype, distinctive features and control, and demonstrated that the distinctive features training was superior to the other two groups. So although both standards and the alternatives were different from those used in training, teaching the dimensions of difference facilitated transfer learning. The rationale for materials in the studies reviewed could be summarized into the following guidelines for development of materials.

a) Provision of qualitatively different problems
b) Provision of a variety of stimulus configurations
c) Provision of materials which enable teaching of distinguishing features. If possible, the distinguishing features should represent the dimension of difference in the criterion task.

On the basis of these principles, the materials for train- were developed which are described in a subsequent section.

In view of the foregoing literature, it was reasoned that if children were taught to use a problem-solving strategy with a variety of stimulus depictions, the subject would then use this same strategy in similar problem-solving situations with different stimuli . Accordingly, the hypothesis was drawn up to test the possibility of learning such a generalized strategy. The MFFT served as a posttest with completely different stimulus depictions from those used in training. The hypothesis then, revolved

around the posttest performance on the MFFT latency and accuracy scores defined as two separate measures of generalized training effect.

HYPOTHESIS OF THE STUDY

The following hypothesis was investigated in this study.

H_1: A significant difference in MFFT latency and accuracy will be obtained by a training group as compared to two control groups.

Since interest in the posttest performance of subjects was not in the joint criteria of latency and accuracy, and whether subjects were categorized as reflectives and impulsives, the hypothesis was stated in terms of latency and accuracy as two separate measures of performance.

A: A significant increase in latency score will be obtained by a training group as compared to control Groups C_1 and C_2.

B: A significant improvement in accuracy (number correct) in MFFT will be obtained by a training group as compared to control groups C_1 and C_2.

CHAPTER III

EXPERIMENTAL PROCEDURE, DESIGN AND MATERIALS

In the previous section, the literature relating to conceptual tempo and the modification of impulsivity was reviewed. This section focusses on research design, procedures and materials. The primary objective of this research was directed at studying a viable techniques by which certain problem-solving strategies of impulsive youngsters could be modified so that their level of accuracy might improve in a subsequent problem-solving task. For this purpose certain instructional materials and methods were administered to a training group and the training effect was compared with a special-attention control and a no-training control. The training effect was measured by MFFT latency score and MFFT accuracy score.

THE SAMPLE

Eighty children ages 8-18 took part in the initial selection procedure. Of these, 4 subsequently moved from The Michener Center, which left 76 individuals, 32 females and 44 males for the classification stage. All were residents of The Michener Center, a residential treatment

center for the developmentally handicapped, and all were students at the school located at the center. Although 26 subjects were classified as impulsive, 14 girls and 12 boys, three were subsequently dropped because of hospitalization, illness and transfer. The remaining 23 subjects were placed in the three groups: Self-instruction Training Group, 8 subjects; Control $_1$ Group, 8 subjects; Control $_2$ Group, 7 subjects. Their median age was 14 years, and their mean I.Q. (Stanford-Binet) was 43.

DESIGN AND PROCEDURES

The design used in this study was the Pretest-Posttest Control Design as described by Campbell and Stanley (1963). A summary of the procedures is found in Table II.

TABLE II

SUMMARY OF PROCEDURES

Pretest	Classify	Randomize	Train	Posttest
Administer MFFT	Select impulsive children on the basis of a double median split	"Impulsive" children placed randomly in 3 groups	Random trainer subject match	Administer MFFT

Pretesting and Classification Procedures

The pretesting was carried out in one session, with each child individually tested on the MFFT Preschool Form. The testing was carried out in a quiet room, usually at The Michener Center School. To obtain a sample of children who were both fast and inaccurate (i.e., impulsive),scores on the MFFT were divided at the medians for both speed and accuracy. Children whose MFFT scores fell below the median latency and below the median for accuracy were defined as impulsive. (See Table III)

TABLE III

MEDIAN SCORES FOR MFFT ACCURACY AND LATENCY

N	MFFT Latency	MFFT Accuracy
76	27.25	7.4

Training Procedures

After the subjects were classified, they were randomly assigned to three conditions: Self-instructional Training, Control $_1$ and Control $_2$.

Self-Instructional Training (SI)

The entire instructional program was developed by the researcher in collaboration with the Psychological Services Department at The Michener Center (see Note 1). Each subject was trained individually in a quiet room at the school, in a training room in the Psychology Department or in a room at the resident's Group Home or Unit. The 8 trainers were Rehabilitation Counselors, Psychological Assistants or Educational Therapists with experience in mental retardation ranging from 6 months to 5 years. The instructional sequence is summarized in Table IV and indicates that there were two main components to the training program.

TABLE IV

SELF-INSTRUCTIONAL FLOW CHART

Part 1:	Pre-Self Instructional Trials
Part 2:	Self-Instructional Trials
	Match-to-sample Training: Familiar Objects, Geometric Designs, Letters and Numbers
	Match-to-sample Recall Training: Familiar Objects, Geometric Designs and Letters and Numbers

Pre-Self-Instructional Training

This section, which preceded the main training module in each lesson, was aimed at assisting children who would have difficulty in understanding the meaning of modelled utterances made by the trainer. Essentially it would facilitate word production, word comprehension, and generally provide functional language training. The rationale for this section was based on work by Humphery (1966) who developed a training sequence for teaching language function in autistic children. Briefly, his sequence involved: 1) word-object association which was repeated until the meaning of the word was established,
2) reinforcement of child's utterances and
3) discrimination and generalization taught by including pictures with qualifying attributes extended to a variety of complex object representations and interrelationships.

This section of the training module in this study served three main purposes:

a) Screening device: The researcher reasoned that the Ss had to meet certain minimal criteria before they could participate in the self-instructional training, i.e., they had to be capable of producing some verbal utterances and capable of understanding some words.

If the resident was unable to complete 5 out of the 10 exercises, the resident would not continue training.

b) Non-Social Verbalization Practice: This section provided practice in associating the verbal name for various features in a generally non-social and functional context. For example, directions such as "point to", "show me", or "put your finger on the big chair would be given while allowing the child to verbalize, "big chair".

c) Familiarization with subject's level of language function: This module would also familiarize the trainer with the expressive language of the subject in addition to indicating the language which would generate performance of a particular task. For example, Constantine and Sidman(1975) described the several attempts made at giving instructions to retarded individuals before the required task (in this case naming as well as matching to sample) occurred. With their subject B.L., the instruction" find the other one..." elicited a self-instruction "other one", and a correct task performance. Subject B.L. was able to name all the objects previously, but only responded to the match-to-sample task with a particular instruction.

In summary, it must be emphasized that this section

is critical to the success of the self-instructional module. The self-instructional model requires more than verbal imitation of the trainer's verbalizations. The trainer must use this opportunity with the resident to determine which words the child knows, and what words will control successful performance. In the self-instructional sequence which follows, the subjects can then be cued or prompted to "spontaneously" produce verbal self-instructions which then facilitate the performance in question.

Pre-Self-Instructional Materials

There are 10 different cards for each lesson. Consistent with the purpose of this section, and discussed in a previous section, these cards represent verbal production exercises and verbal comprehension tasks for letters, numbers, geometric designs and their distinguishing features. The categories represented by the pictures and their various stimulus components are the same type as those in the match-to-sample tasks composing the self-instructional module. The 10 pictures, their category and the exercise associated with the picture is listed below. The abbreviations are F.F. (Familiar Figures), G.D. (Geometric Design) and L & N (Letters and Numbers).

No.	Feature Represented and/or Category		Exercise
1.	Object: F.F., G.D.		Labelling
2.	Long and Short	F.F.,G.D. L&N	Point to "long" object Say "long"
3.	Same and Different	"	Respond with "yes" or "no" to the question "Are these same?"
4.	Small and Large	"	Point to "small" F.F.G.D., or L&N. Say "large", "small"
5.	Top and Bottom	"	Same as above
6.	Left and Right	"	Same as above
7.	Inside and Outside	"	Same as above
8.	Pointed and Round	"	Same as above
9.	Upside down	"	Same as above
10.	Numbers		Counting

Examples of Pre-Self-Instructional Materials may be found in Appendix C.

Self-Instructional Training

The self-instructional model used here is abstracted from the data of Guralnick(1976) and Meichenbaum and Goodman(1971). The general strategy is to have the trainer model the problem-solving process in terms of his verbalizations, and corresponding motor behavior. The residents are then promptdd to carry out and verbalize the steps overtly and then covertly in each lesson. Instructions to go slowly, to look carefully and to self-reinforce are included in the self-instructional sequence. The training materials include match-to-sample tasks using line drawings of geometric designs, familiar objects and letters and numbers.

The instructions given by the trainer which the resident will try to follow include the rules abstracted from the visual scanning data reported by Siegelman (1969) and Drake(1970) and would be represented by the following principles:

a) Taking time to look at all the standards and alternatives.
b) Scanning the whole array of variants
c) Noticing particular parts which are different.
d) Eliminating incorrect alternatives.

The entire instructional procedure including the general guidelines the trainer used to determine his verbalizations can be found in Appendix A, and included the following kinds of instructions:

"Wait"

"Look carefully"

"No" or "Yes"

"Good", "That's right"

The specific instructions and the verbalizations varied depending on the trainer and trainee, and the former's ability to generate verbal responses and subsequent correct or required task performance. After watching the trainer practice reflective problem-solving strategy, the resident practiced the strategy, first talking aloud, then whispering to himself and finally covertly with lip movements only. All subjects received 9 individualized lessons of 30 minutes each over a period of 3-4 weeks. The lessons are summarized in Table V.

TABLE V

SUMMARY OF THE SELF-INSTRUCTIONAL TRAINING PROGRAM

	1	2	3	4	5	6	7	8	9
Pre-self instruction	X	X	X	X	X	X	X	X	X
Match-to-sample	X	X	X	X	X	X	X	X	X
Delayed Match-to-sample	X	X	X	X	X	X	X	X	X

Self-Instructional Materials

The nature of the training materials developed for this section was based on and derived from the work of Guralnick(1976), Egeland (1974) and Odom, McIntyre and Neale(1971). Several steps were followed in determining the criteria for the training materials.

a) Since material used in this present study needed to be suitable for retarded children and amenable to self-instructional teaching, the Guralnick(1976) study was ideal in providing a basic model.

b) Guralnick(1976) was unable to obtain a generalized training effect and suggested the use of varied problem materials. Here the work of Egeland(1974) provided data on tasks and exercises including different problem situations and different stimulus configurations.

c) The purpose of the present study was to obtain a transfer or generalization effect of training, so the transfer study of Odom, McIntyre and Neale (1971) was consulted and ideas abstracted on how the type of material or training realized transfer effect. From this study it appeared that training drawing attention to distinguishing features would best enhance transfer possibilities.

On the basis of this information, the following criteria were considered and materials developed accordingly.

1) Provision of qualitatively different problems;
   a) Match-to-sample as well as delayed match-to-sample.
   b) Varied categories of picturs: letters and numbers, familiar objects and geometric designs.
   c) Varied dimensions of difference: The distinctive features of the three categories were those listed in the pre-self-instruction:
      1) Long and short
      2) Same and different
      3) Small and large
      4) Top and bottom
      5) Left and right
      6) Inside and outside
      7) Pointed and round
      8) Upside down and rotation

2) Magnitude of difference varied in two ways:
   a) Global differences to feature difference (i.e., The standard and alternatives were all different objects, letters and numbers or goemetric designs, as opposed to being the same object, letter or number or geometric design with a feature(s) differing.
   b) Feature difference varied in degree of exaggeration in size of gap, degree of curvature etc., from very

obvious to just noticeable.

The training materials were developed to provide the opportunity via self-instruction to draw attention to distinguishing features and to dimensions of difference while prompting and leading the resident to spontaneously self-instruct. Examples of Self-instructional materials may be found in Appendix D.

TEST MATERIALS AND PROCEDURES

Matching Familiar Figures Test (MFFT)

The MFFT, developed by Kagan and his associates (Kagan et al.,1964), is the most widely used match-to-sample test in cognitive tempo research. Its use in this research allows for comparison with the mainstream of research in the area. In addition, by definition, the impulsive individual is one who responds quickly and inaccurately in situations presenting a high degree of response uncertainty. Kagan(1965) indicates that the MFFT is the test providing the highest degree of response uncertainty.

This instrument is composed of 11 test cards and two practice items, each of which consists of line drawings of familiar objects. Subjects are shown a picture of the familiar object(the standard) and four alternatives, only one of which is identical to the standard. The task is to choose the variant which is identical to the standard.

Scoring is based upon the time taken to make an initial response to each stimulus card and the total num-

ber of correct items. On the two practice items, the examiner would help the child to find the correct answer. In other words, when a child committed an error, the examiner said, "No, that is not the right one. Find the one that looks just like this one," and pointed to the standard, and continued coding until the child made a maximum of four responses or got the item correct. If the child was still incorrect after four responses, the examiner would show the subject the right answer.

TRAINING PROCEDURES AND MATERIALS IN CONTROL$_1$

The purpose of this group was to control for special attention effects. It was felt that because of the increased individualized attention received by the subjects from the trainer and perhaps from other adults aware of the training project, "history" (Campbell and Stanley, 1963) would not be adequately controlled by a pretest-posttest control group. Thus the design of this study included Control$_1$, with the requirements

a) that this group not receive specific visual discrimination training which would contaminate training effect measurement and
b) that the individuals in the group receive comparable attention to those in the training or experimental group.

Considering the "research policy" of The Michener Center, it was felt that individuals in the Control$_1$ group should be involved in skills which would be useful to the participants, and not simply fulfill an experimental condition. In view of this, nine structured lessons, each about 30 minutes in length were developed which revolved around question-answering skills (see Note 2). A brief summary of a lesson is provided here, but more detailed instructions for Control$_1$ may be found in Appen-

dix E.

a) Warm-Up Phase: This phase is simply a conversation period so that the resident may become comfortable and at ease with the trainer. Pictures are provided so that the conversation may revolve around a topic.

b) Target Skill: Each lesson contains 10 or more questions in which the resident practices answering the question in a clear and audible voice. The rationale for the skills taught in this section were based on such studies as the one by Floor and Rosen(1975) which discusses the difficulties that retarded individuals have in answering simple questions.

c) Assertion Task: The resident learns to express himself in a situational task.

PROCEDURE FOR CONTROL$_2$

This group received no training, and only participated in the prestest and posttest procedures. This group controlled for the procedural irregularity in the use of the same version (vs. equivalent forms) of the MFFT for the pretest and posttest.

CHAPTER IV

RESULTS AND DISCUSSION

Analysis of MFFT Accuracy and Latency

The dependent variables, latency scores and accuracy scores on the MFFT were compared between the training group and the control groups using analysis of covariance, with the pretest scores as covariates. The use of covariance analysis rather than change scores was based on a suggestion by Cronbach and Furby (1970), which pointed out the fallacy of using change scores especially when the covariate(pretest) is highly correlated with the criterion variable within groups, which is the case in the present study.

Analysis of MFFT Accuracy

The analysis of covariance of accuracy scores is summarized in Table VI. The prediction that the subjects in the experimental condition would perform significantly better than those in the control groups was not substantiated. Although there was some improvement, it was not at a significant level. These results would appear to be inconsistent with the findings of Guralnick(1976) which demonstrated that the self-instruction method was an effect-

ive means of modifying the problem-solving strategies of handicapped children. In relation to this, it should be noted that Guralnick(1976) had two dependent measures:
a) a posttest very similar to training materials and
b) the MFFT accuracy score.
The strategies that the treatment group learned, generalized to posttest (a) but not to the MFFT accuracy score. Considering this, the results of the present study may be viewed as having results similar to the Guralnick findings and demonstrating task specificity of training effects.

TABLE VI

SUMMARY OF ANALYSIS OF COVARIANCE ON MFFT ACCURACY SCORE

SOURCE	S.S.	d.f.	M.S.	F	p
BETWEEN GROUPS	7.68	2	3.85	1.05	.37
WITHIN	69.73	19	3.67		
TOTAL	77.41	21	7.51		

Analysis of MFFT Latency

The analysis of covariance of latency scores is summarized in Table VII. Again, there was no significant difference in response latencies of the children in the three groups. In past studies, it has been shown that it

is relatively easy to lengthen response latencies by a forced delay method. In the training program, a forced delay component was imposed as part of the strategy using the self-instructional sequence. According to the anecdotal records kept by the trainers, there was virtually no difficulty in teaching the forced delay procedure. The Lowry and Ross (1975) study offers a possible explanation. They demonstrated that all four severely retarded children improved in a color discrimination task during delay trials, but fell back to chance levels when the opportunity for a no-delay trial arose. In the present study, the residents were in a "delay to no-delay" situation insofar as the post-test did not allow the examiner to give any instructions such as "Wait" or "Go slowly."

TABLE VII

SUMMARY OF ANALYSIS OF COVARIANCE ON MFFT RESPONSE TIME

SOURCE	S.S.	d.f.	M.S.	F	p
BETWEEN GROUPS	88.48	2	44.24	.694	.51
WITHIN	1210.49	19	63.71		
TOTAL	1298.97	21	107.95		

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

Research which demonstrated that differences in eye-scan movements of reflectives and impulsives do exist, initiated interest in scanning strategies and the possibility of teaching effective problem-solving strategies. This present research was designed for the purpose of modifying the impulsive strategies of 23 retarded youngsters so that they could use their newly acquired skill in other related tasks. The self-instructional technique, which encouraged residents to verbalize what they were doing, and the use of materials designed to enhance such strategies were developed.

Following the selection of 23 "impulsive" children from the Michener Center School, using the median split procedure on MFFT response time and accuracy, the children were randomly placed in the treatment group (8) subjects), the $Control_1$ group (8 subjects) and in the $Control_2$ group (7 subjects). The children in the training group received 9 individualized lessons of approximately 30 minutes each. The Special Attention Control received comparable individualized training,

and the $Control_2$ received no training.

The hypothesis of the study was to determine if the treatment group would have improved performance on a posttest which was composed of standards and alternatives different from the training materials. The criterion measure, the MFFT and the two measures of performance, accuracy and response time were used as separate measures to generate the hypotheses:

A: A significant difference in MFFT latency score will be obtained by a training group SI as compared to control groups C_1 and C_2.

B: A significant difference in MFFT accuracy scores will be obtained by a training group SI as compared to control groups C_1 and C_2.

An analysis of covariance was conducted on the data to test for significant differences in the performance of the MFFT. The hypothesis predicting treatment effects for the SI group was not substantiated and empirical support for a generalized training effect was not realized.

The results of the study were puzzling considering the significant improvement in response time and errors in similar studies employing mentally retarded adolescents as subjects (Duckworth, Ragland, Sommerfeld and Wyne, 1974; Guralnick, 1976; Lowry and Ross, 1975). The major difficulty encountered with the method may have contributed to the non-significant results. The role of "rehearsal" was determined to be a critical component of the self-instructional sequence (Meichenbaum and Goodman, 1971). However, in the present study, the trainers were virtually unable to determine if the verbal "rehearsal" by the subject was functional and self-guiding speech as required, or merely verbal imitation of the trainer. If residents were using speech in a social sense, or responding to external stimuli ("You say it now"), then "self-instruction" as defined by Meichenbaum and Goodman (1971) was not being carried out, and the results would reflect "imitation" training, and not self-instructional training.

Similarily, the strength of the self-instructional sequence was in modelling plus rehearsal of verbal coding, but the resultant complex procedure may have been created "interference" processes influenced by rate, temporal distribution, and serial organization of stimulus inputs (Bandura, 1969).

Such difficulties as well as the realization that periodic reproduction of modeled segments was likely to elicit and sustain greater attentiveness to modeling stimuli (Maccoby, Michael and Levine, 1961) was considered in the training procedure. The trainer was instructed to avoid presenting massed exposure to modeling stimuli in long, uninterrupted sequences by interposing resident rehearsal into the total modeling sequence. On the other hand, there was concern in breaking up the learning into such small segments that the pattern of a larger, more natural sequence was lost. In total, the ability to interpret and practice these principles on an individualized basis required considerable expertise, and future experiments might consider the level of trainers' skills available.

IMPLICATIONS FOR FURTHER RESEARCH

The review of the literature (Messer, 1976),indicated that pertaining to conceptual tempo and the definition of "impulsivity" there is no normative data available. Such normative data with various populations with a standard instrument such as the MFFT would greatly increase efficiency of research in modification techniques. Because one researcher's impulsives could be another's reflectives, it is difficult to determine the suitability

or relevance of particular methods.

Related to the MFFT, Wright (see Note 4) recently suggested a revised scoring system for the MFFT which yields two independent scores for the subjects. The first score places the subjects on an impulsivity continuum and avoids classification into four categories. This score is defined as the "z" score for errors minus the "z" score for latency divided by 2. This procedure yields a range of scores from -3 to +3 (assuming a normal distribution) with high scores indicating impulsivity and low scores indicating reflectivity.

The second score Wright has devised is an "efficiency" score and is defined as the sum of the "z" score for errors and the "z" score for latency. This score yields a high score for subjects who make few errors and have short latencies and are "maximally efficient". Wright(1974) argues that the two scores are independent and that reflective and efficient subjects should do well in most tasks. The scoring system as suggested by Wright(1974) and the concept of "efficiency" may be a useful way of viewing impulsive-reflective response styles, as compared to the "adaptive-maladaptive" model developed by Kagan(1966). As recently noted by Rollins

and Genser(1977), the assumption that the reflective response style is more adaptive in most situations may not be true.

Finally, a comment on the self-instructional method and its difficulty to program effectively should be discussed. The complex and somewhat "clinical" nature of the training is acknowledged by its developers, Meichenbaum and Cameron.

> "Impulsive children vary markedly in how much training they need. Some may require many trials of modeling, and many trials of overt self-instructional rehearsal, whereas others may go covert quickly. The speed with which the therapist fades the self-instructional rehearsal depends on the child's performance. The importance of individually tailoring the self-instructional treatment package was illustrated by a study on the development of verbal control by Meichenbaum and Goodman(1969). They found that forcing first grade children to talk to themselves aloud while performing a task interfered with performance where younger children benefitted from such overt self-instructions." Meichenbaum and Cameron(1974, p.169).

The fading out procedure used in this study was essentially one of fading external cues and prompts over each lesson, and not over the period of the nine lessons. An approach more consistent with the self-instructional theory would be consideration of each individual's performance and a particular criterion level, rather than on prearranged programmed basis. More observational studies on the development of spontaneous language in retarded children and the functional role it plays in non-language tasks would facilitate efforts to try to "program" self-rehearsal and fading.

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APPENDIX A

SELF-INSTRUCTIONAL PROGRAM

GENERAL INSTRUCTIONS

1. The entire visual discrimination training consists of three sequential phases:
   (1) Pretesting
   (2) Training
   (3) Posttest
   The training consists of nine sessions, each session approximately 30 minutes in length.

2. In Pretesting and Posttest, respond with "thank you" for the resident's response, whether correct or incorrect. Under no circumstances should the trainer give any consumable rewards or verbal praise to the resident during the pre and post-testing trials.

3. In the training phase however, the trainer may give the following verbal praise whenever appropriate:
   (a) Good; Very good, Mike
   (b) Right; Right on, Mike
   (c) A good job Mike; very nice
   (d) Good try Mike.

PRETESTING

1. Practice Phase: There are three warm up trials.

   (a) Display the stimulus card containing the standard as well as the alternative in front of the resident so that it is approximately 12 inches in front of the resident.

   (b) Say, "Look at this," (standard) and "touch the picture on this page that looks just like it."

   (c) Record latency to first response.

   (d) When a resident shows a correct response say, "Thank you."

   (e) When a resident shows an incorrect response say, "No, that is not the right one. Find the one that looks just like this." (Point to the standard).

   (f) If resident makes error again, continue to repeat and continue to code, until a maximum of 5 errors is made.

2. Pretesting Phase

(a) The stimulus cards are displayed exactly the same way in the warm-up phase and the verbal instruction "Mike touch the picture that looks just like this" is used for each trial. Please record the resident's choice as well as the response time for each trial. The response time is defined as the time interval in seconds between the termination of the trainer's question and the resident's first response, whether correct or incorrect.

(b) When the resident chooses an incorrect answer, do not indicate the correct answer. The trainer just records the response time and the choice.

(c) No instructions should be given to go slowly, to look more carefully, to check again, or to do a good job.

(d) No verbal praise should be given during this pretesting phase. Only respond with "Thank you" for each response, whether correct or incorrect.

(e) Do not repeat the question during the pretesting trials. This means that the correct answer must be based on the resident's first response after the termination of the trainer's question.

TRAINING PHASE

1. At the beginning of the training session, the trainer explains that there are certain "nice" ways to solve a problem.
2. The general strategies that the trainer should follow throughout training sessions #1-#9 are as follows. The trainer models the problem-solving process in terms of his overt verbalization and corresponding motor behaviors. Within each lesson the resident is prompted to carry out and verbalize (first overtly, then covertly) the self-instructions.

   The trainer must demonstrate the process of eliminating incorrect answers by describing each alternative and checking with the standard. Below are listed some examples of verbalizations which may be used as instructions.

   (a) Wait. I shouldn't hurry. Go slowly. (Forced delay--hold back resident's hand).

   (b) Look carefully at <u>all</u> the pictures (Scanning, pointing to all the pictures).

   (c) Look at this part, this part is _____ (different, pointed, shorter, round, etc.). The trainer is promting by pointing to a distinctive feature.

(d) These are different, and use a throwing out gesture with the hand. (The trainer may also shake head and say "No").

(e) This is the same.

(f) Good! I've got it! (Reinforcement or self-reinforcement).

The trainer should note that whether he models overt or covert self-instructions, he should always use appropriate motor behavior. Somehow, the resident must observe the process that the incorrect alternatives are sucessfully eliminated. Also, for each successful response, the trainer should praise the resident and explain why he is right ("Very good, Mike, you looked carefully"; "A good job Mike, you went slowly"; "Good, the pictures are the same".

The specific steps involved in self-instruction teaching are as follows:

(a) The trainer performs the task overtly(talking aioud) as well as demonstrating appropriate motor responses; then the resident imitates the same task.

(b) The trainer performs the task while whispering to himself(lip movements) with appropriate motor responses; then the resident imitates the same task.

(c) The trainer models the task covertly (without lip movement) with appropriate motor behavior; then the resident imitates the same task.

The following may be an example of the trainer's verbalizations which the resident might subsequently

might imitate. However, it should be mentioned that at the early stages of training, the trainer may be able to use only a few words of self-instruction. As the training sessions progress, the amount of self-instruction is gradually increased.

> "Okay, you want me to touch the picture that looks just like this(point to the standard). I have to go slow and be careful. I am going to look at all the pictures. Oh! this is a dog, and this is a circle. This is a ... (describe each alternative). Which is the same as this (the standard)? This is out because ...(describe the difference). This looks like the one. But wait, I must make sure. I will check to make sure sure. Yes, this is okay. Good! I got it! I did it!"

Description of the Standard and Alternatives

It was pointed out earlier that throughout the training sessions the trainer needs to describe the standard as well as the alternatives. How? Here are a few concepts that the trainer might use where appropriate:

1. <u>Labeling</u> "This is a circle(boat, tree)."

2. Long and Short "This arrow is longer than that".
3. Same and Different " This one is the same as that, but that one is different."
4. Small and Large "This is much bigger than this."
5. Top and Bottom " This is a little triangle at tip of a big circle."
6. Left and Right " This is a face looking this (gesture) way."
7. Outside and Inside "This triangle is inside of this circle".
8. Pointed and Round " This arrow is pointed (sharp) but that one is round".
9. Upside-down "This face is upside-down" It looks funny that way."
10. Numbers: one, two, three and many "This is a house. It has one(two, three, many) windows".

TRAINING SESSION 1

Each of the 9 training sessions consists of two sequential parts: Pre-self-instruction and self-instruction trials. In all sessions, the trainer should complete the pre-self-instruction part before he starts the self-instruction trials

The purpose of the pre-self-instruction trials is to familiarize the resident with some concepts necessary for efficient visual discrimination. The 10 trials (10 pictures) at the beginning of each lesson provide practice in associating the verbal name for each concept.

The first pre-self-instruction lesson will also serve as a screening device. If the resident does not have sufficient verbal or conceptual abilities to satisfactorily complete five of the trials, the trainer does not continue training. The pre-self-instruction procedure is as follows:

(1) The trainer presents each of the 10 stimulus cards and asks the question. Verbal feedback such as "right" or "good" for the right response.

(2) After the trainer asks the question, and the

resident responds, have the resident verbalize the concept. For example, the trainer asks the question, "Is this longer or shorter than this?" After the resident makes the correct response, the resident is asked to say "longer" or "shorter" to the appropriate stimulus.

Part 1. Pre-Self-Instruction Trials(Card #1-10)

Card 1: Labelling: What is this?

Card 2: Is this longer or shorter than this?

Card 3: Are these the same or different?

Card 4: Which is smaller(or larger)?

Card 5: Is this on the top or at the bottom of this?

Card 6: Is this on the left or right of this?

Card 7: Is this outside or inside of this?

Card 8: Is this pointed or round?

Card 9: Is this upside-down?

Card 10: How many "legs" (arms, windows, etc.) does this have?

Part 2. Self-Instruction Trials (Card #14-19)

A. Match-to-Sample Training

The trainer presents the standard, and while keeping it in full view of the resident, asks the resident to select the correct alternative. The amount of self-instruction teaching for each

stimulus card should be simple and short at the early part of the training, and as the training sessions progress, it should be gradually increased in length. For example, in Session 1, the trainer might use only a few words of self-instruction (e.g. Find the same picture. Look carefully). In Session 2, the trainer might increase the length of the self-instruction(e.g. Find the picture the same as this. Look very carefully. Oh! this is a snake). The order of presentation is: match-to sample training and recall training.

Card # 14 Match-to-sample training using familiar objects (The trainer models the task talking aloud, and using short instructional sentences, has the resident imitate the same task).

Card #15 Match-to-sample training using geometric designs (The trainer models the task while whispering to himself--lip movements-- and using short instructional sentences, has the resident imitate the same task).

Card #16 Match-to-sample using letters and numbers (The trainer models the task covertly, without lip movement; then the resident imitates the same task).

B. Recall Training

Using the same stimulus cards that were used for the match-to-sample task, the trainer presents the standard for 10 seconds, removes it, and then asks the resident to select the correct alternative from memory. After the resident makes his choice, he is presented with the standard and asked to determine if his choice is correct.

Card #14 Recall training using familiar objects (The trainer models the task talking aloud and using short instructional sentences, has the resident imitate the same task).

Card #15 Recall training using geometric designs (The trainer models the task while whispering to himself, and using short instructional sentences, has the resident imitate the same task).

Card # 16 Recall training using letters and numbers (The trainer models the task covertly, and has the resident imitate the same task).

TRAINING SESSION 2

Like Session 1, Session 2 begins with the pre-self-instruction trials (Cards #20-29). However, the order of presentation within each of the match-to-sample and recall training in the Self-instruction trials should be the reverse of that in the previous session.

Part 1. Pre-Self-Instruction Trials (Card #20-29)

The same procedure used in Session are used. That is, the trainer presents each of the 10 stimulus cards, asks the question, and then gives verbal feedback ("Right" or "good") for each of the resident's responses. When the response is incorrect, the trainer should point out the correct answer with necessary explanations.

Part 2. Self-Instruction Trials (Cards #30-32)

Match-to Sample Training

Card # 30. Letters and Numbers (Talk aloud)

Card # 31 Geometric Designs (lip movement)

Card # 32 Familiar Objects (covert)

Recall Training

Card # 30. Letters and numbers (talk aloud)

Card # 31. Geometric designs (lip movement)

Card # 32. Familiar objects (covert)

TRAINING SESSION 3

In Session 3 the order of presentation changes again in the following manner: geometric designs, familiar objects and letters and numbers.

Part 1. Pre-self-instruction Trials (Card # 33-42)

Part 2. Self-instruction Trials (Card # 43-45)

Match-to-Sample Training

Card #43 Geometric designs (talk aloud)

Card #44 Familiar objects (lip movement)

Card #45 Letters and numbers (covert)

Recall Training

Card #43 Geometric designs(talk aloud)

Card #44 Familiar objects (lip movement)

Card #45 Letters and numbers (covert)

Throughout the rest of the training sessions, only the order of card presentation within match-to-sample and recall training in the Self-instruction trials varies. The specific order of presentation for each session is listed in the next few pages.

TRAINING SESSION 4

Part 1. Pre-self-instruction Trials (Card #45-54)

Part 2. Self-instruction Trials (Card # 54-56)

Match-to-sample Training

Card # 54. Familiar objects (talk aloud)

Card # 55. Geometric designs (lip movement)

Card # 56 Letters and numbers (covert)

Recall Training

Card #54. Familiar objects (talk aloud)

Card #55. Geometric designs(lip movement)

Card #56. Letters and numbers (covert)

After Lesson # 4, the trainer may use his judgement in fading out"overt" and "whispering" steps of the self-instruction method. In other words, the trainer should only model the "talking aloud" and "whispering" steps when the resident makes errors because of haphazard and unsystematic responding.

TRAINING SESSION 5

Part 1. Pre-self-instruction Trials (Card # 57-66)

Part 2. Self-instruction Trials (Card # 67-69)

Match-to-sample Training

Card # 67. Letters and numbers(talk aloud)

Card # 68. Geometric designs (lip movement)

Card # 69. Familiar objects (covert0

Recall Training

Card # 67. Letters and numbers (talk aloud)

Card # 68. Geometric designs (lip movement)

Card # 69. Familiar objects (covert)

TRAINING SESSION 6

Part 1. Pre-self-instruction Trials (Card 70-79)

Part 2. Self-instruction Trials (Card 80-82)

Match-to-sample Training

Card # 80. Geometric designs(talk aloud)

Card # 81. Familiar objects (lip movements)

Card # 82. Letters and numbers(covert)

Recall Training

Card #80. Geometric designs (talk aloud)

Card #81. Familiar objects (lip movements)

Card #82. Letters and numbers (covert)

TRAINING SESSION 7

Part 1. Pre-self-instruction Trials (Card 83-92)

Part 2. Self-instruction Trials (Card 93-95)

Match-to-sample Training

Card # 93. Familiar objects (talk aloud)

Card # 94. Geometric designs(lip movement)

Card # 95. Letters and numbers(covert)

Recall Training

Card # 93. Familiar objects(talk aloud)

Card # 94. Geometric designs (lip movements)

Card # 95 Letters and numbers (covert)

TRAINING SESSION 8

Part 1. Pre-self-instruction trials (Card # 96-105)

Part 2. Self-instruction trials (Card # 106-108)

Match-to-sample Training

Card # 106. Letters and numbers (talk aloud)

Card # 107. Geometric designs (lip movements)

Card # 108. Familiar objects (covert)

Recall Training

Card # 106. Letters and numbers (talk aloud)

Card # 107. Geometric designs (lip movements)

Card # 108. Familiar objects (covert)

TRAINING SESSION 9

Part 1. Pre-self-instruction Trials (Card # 109-118)

Part 2. Self-instruction Trials (Card #119-121)

Match-to-sample Training

Card # 119. Geometric designs (talk aloud)

Card # 120. Familiar objects (lip movement)

Card # 121. Letters and numbers(covert)

Recall Training

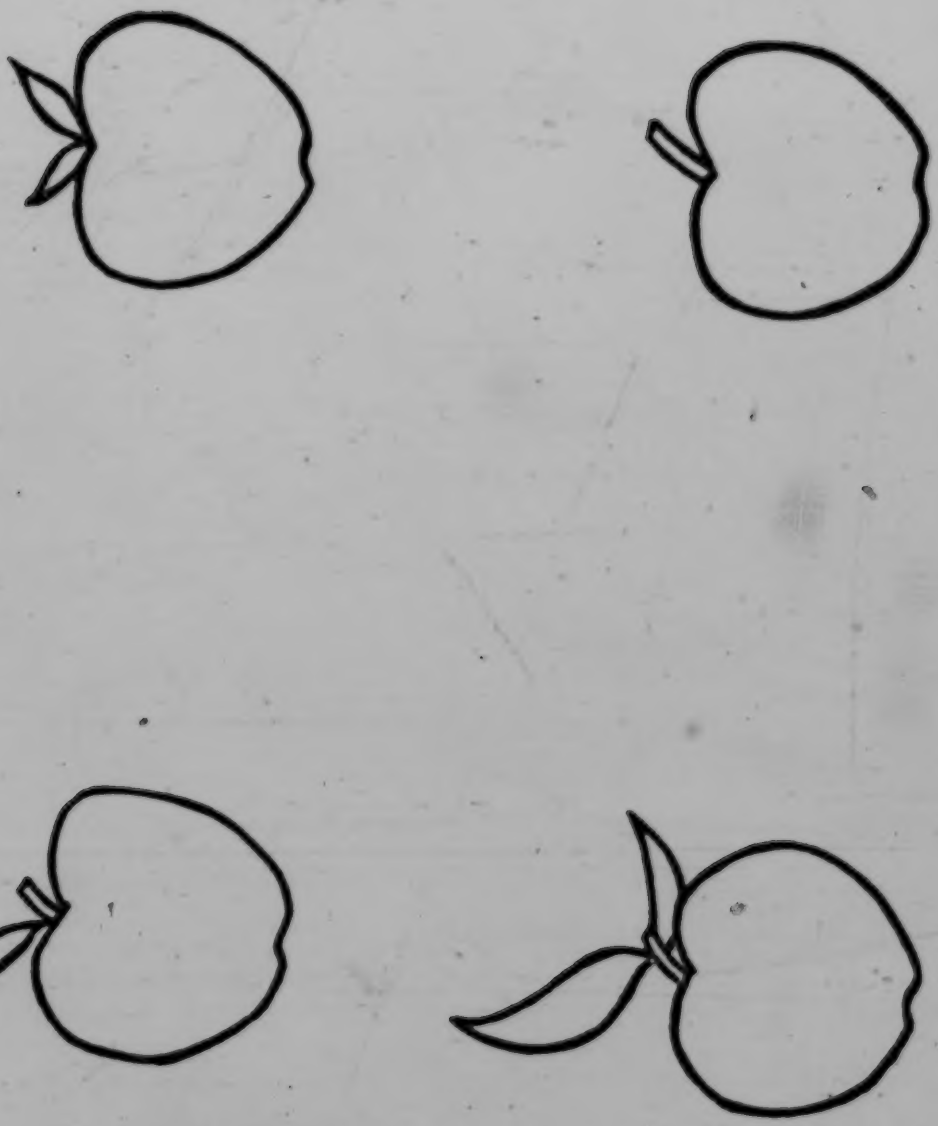
Card # 119. Geometric designs (talk aloud)

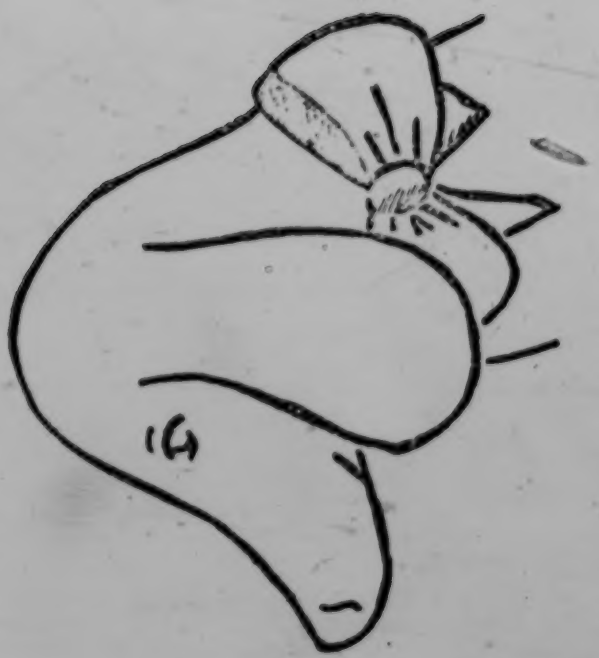
Card # 120. Familiar objects (lip movement)

Card # 121. Letters and numbers (covert)

APPENDIX B

EXAMPLES OF TEST MATERIALS

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(a)

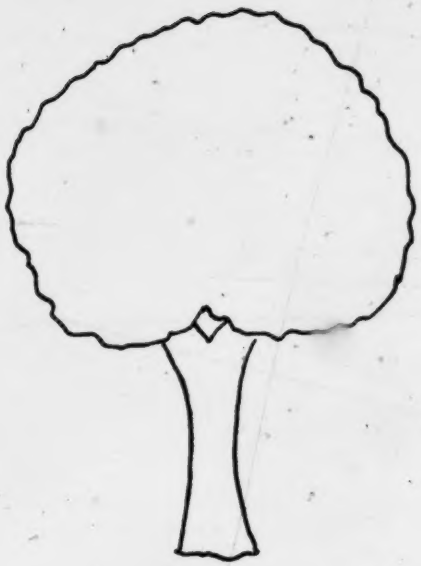
(b)

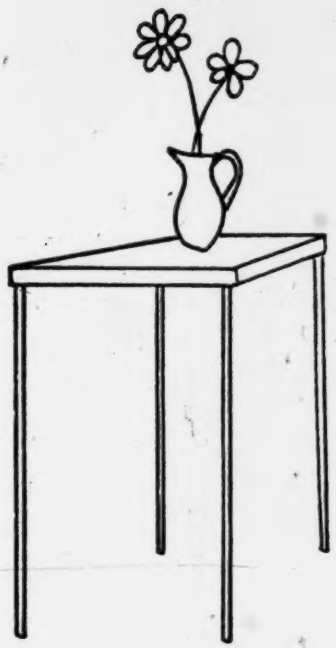
(c)

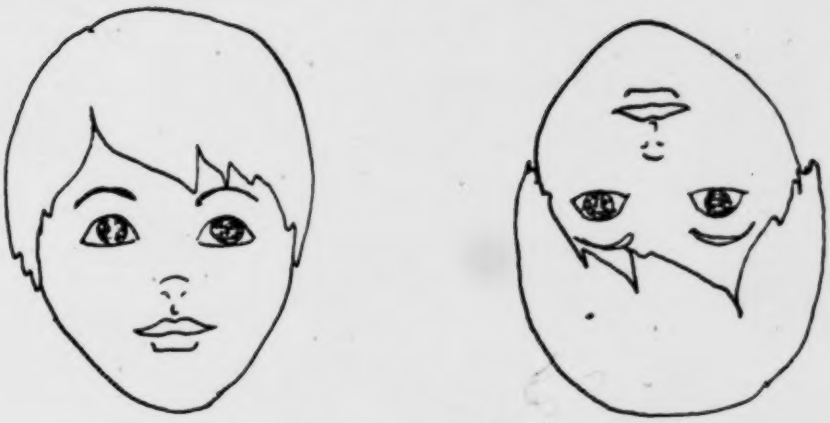
(d)

APPENDIX C

EXAMPLES OF SELF-INSTRUCTIONAL MATERIALS

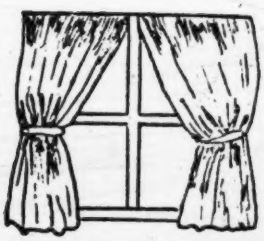


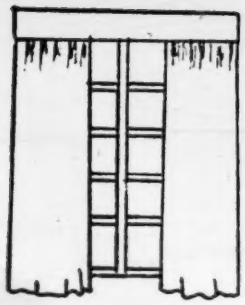


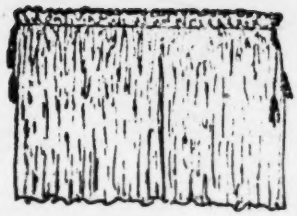


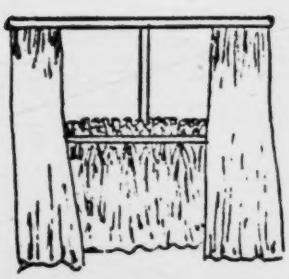
APPENDIX D

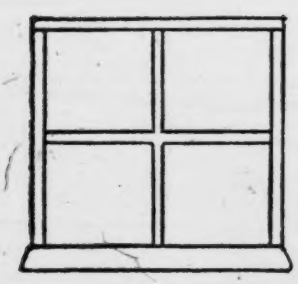
EXAMPLES OF SELF-INSTRUCTIONAL MATERIALS

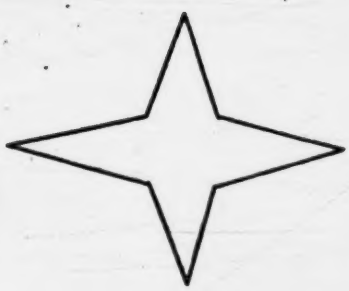


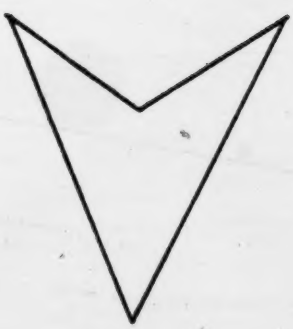


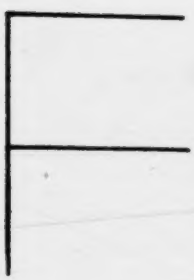


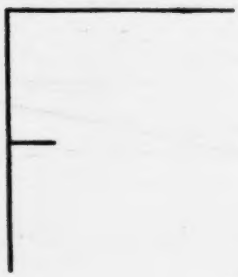


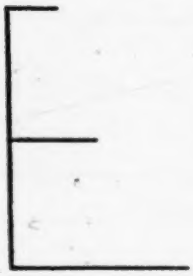


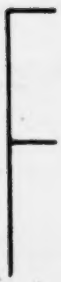


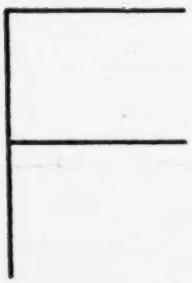


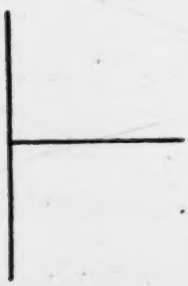


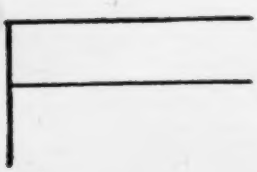












APPENDIX E

$CONTROL_1$ LESSON EXAMPLE

Lesson # 4

Warm-Up Phase

Training

Review: Repear 3 questions from Session #3.

Target Skill: Learning to say "Yes", "No", and "I don't know".

Sometimes a question is very difficult, but the resident hesitates to say he does not know the answer. Say, "when the question is very hard, and you do not know the answer, say 'I don't know'. We will practice some examples." Discourage head shaking, "no" or other sounds when the resident should say "I don't know".

Question 1. "Are you a hypochondriac?" If the resident says "yes" or "no" ask him if he knows the meaning of the word. Presumably he will not know. The trainer must then explain that when he does not know the meaning of a question, he must answer "I don't know". Let the resident practice saying "I don't know" and repeat the question. Question # 3 and 5 also contain difficult words and thus a similar procedure is followed.

Question 2. "Do you like ice cream?" It seems fair to suppose that most residents can answer "yes" or "no" ; therefore an "I don't know" answer should be questioned. If the trainer feels that an "I don't know" answer is genuine, he will proceed to the next example.

Question 3. "Do you like Shakespearean plays?" (Same procedure as in # 1.)

Question 4. "Do you like Johnny Cash?" (Same procedure as in #2)

Question 5. "Do you believe in hypnosis?" (Same procedure as in #1)

Question 6. "Do you like playing games and having fun?" (Same procedure as in #2)

Question 7. "Do you believe academics are important?" (Same procedure as in #1)

Question 8. "Do you think candy is bad for you?" (Same procedure as in #2)

Question 9. "Do you like to make your own decisions?" (Same procedure as in #1)

Assertion Task

Block Counting(1 block, 2 blocks, 3 blocks)

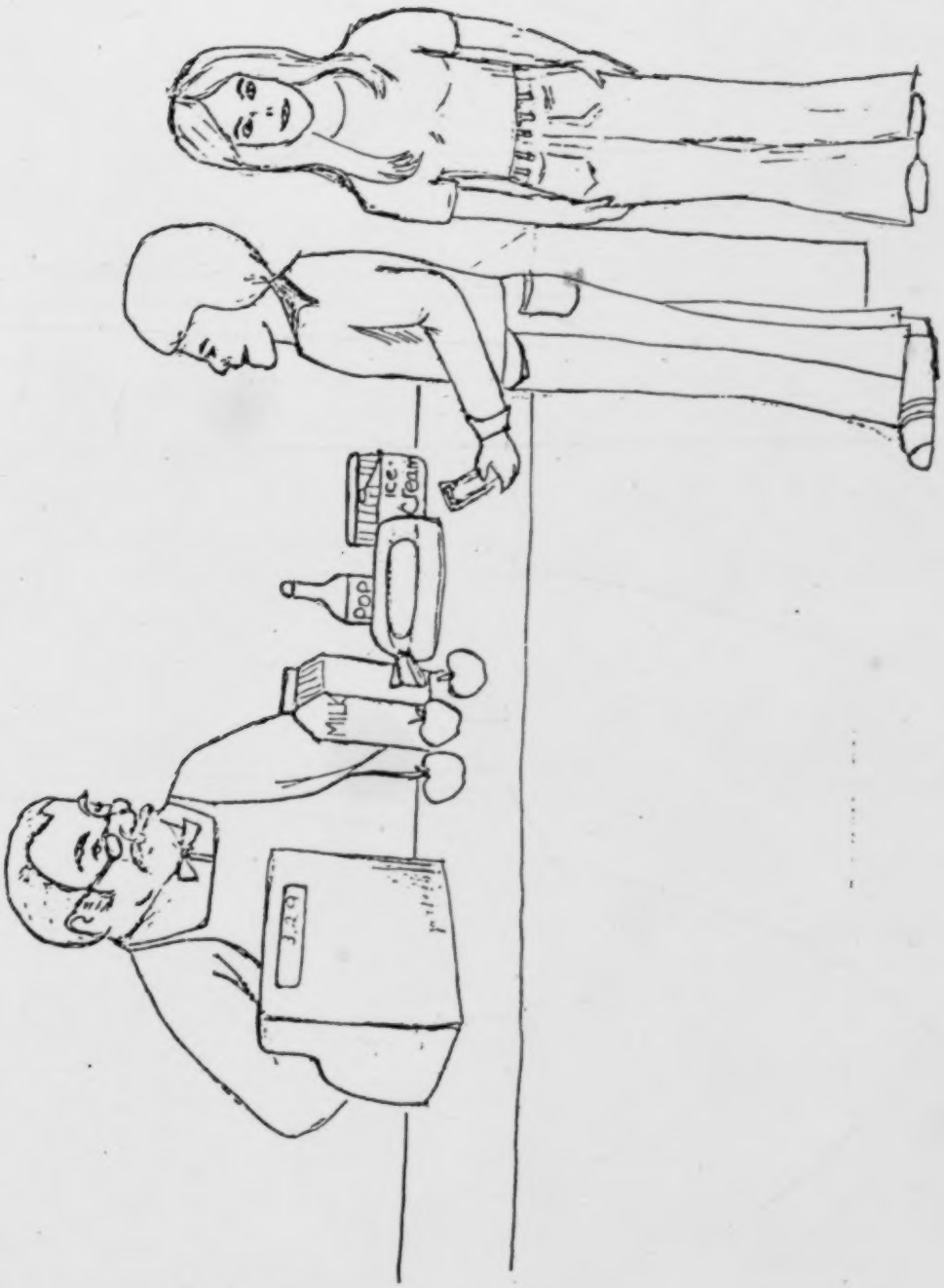
The resident is told there are some blocks in a box. He is then asked to close his eyes, feel the number of blocks, and tell the trainer the number. The trainer says"no, I don't think that is the right number. Will you check again". When the resident says the number again say, "are you sure?" The resident checks again and says the number again. Now the trainer says," let's check... you were right. I was wrong and you were right.... good."

Repeat with two blocks and three blocks if time permits.

Warm-Up # 4: The Store

Possible questions for discussion

1. "What do you see on the counter of the store?"
2. "How many apples are there? Do you like apples?
   Do you think you should eat one apple every day?"
3. "What is Bob going to do?"
4. "What is the other man going to do?"
5. "Do you like to go to a store?"
6. "What things do you like to buy when you go to a store?"
   How much do they cost?"


ice cream
POP
MILK